

Sub 17

I claim:

1. A method for a parent device to access a service of a child device in a driver stack, the method comprising:
  - creating a virtual device;
  - binding the virtual device to the parent device;
  - inserting the virtual device in the driver stack below the child device; and
  - accessing the service of the child device.
2. A method according to claim 1, wherein the driver stack is a dynamic driver stack.
3. A method according to claim 2, wherein accessing the service of the child device includes accessing the service of the child device by the parent device.
4. A method according to claim 2, wherein accessing the service of the child device includes incrementing a reference count of a number of users of the service of the child device.
5. A method according to claim 2, wherein binding the virtual device includes arranging the parent device to receive a query to remove the dynamic driver stack sent to the virtual device.
6. A method according to claim 2, the method further comprising:
  - receiving at the virtual device a query to remove the dynamic driver stack;
  - releasing the service of the child device; and
  - passing the query to remove the dynamic driver stack to a next device in the dynamic driver stack.
7. A method according to claim 6, wherein releasing the service of the child device includes releasing the service of the child device by the parent device.
8. A method according to claim 6, wherein releasing the service of the child device includes invoking a code within the virtual device that accesses the parent device.

1           9.       A method according to claim 6, wherein releasing the service of the child  
2 device includes decrementing a reference count of a number of users of the service of the  
3 child device.

1           10.     A method according to claim 2, wherein accessing the service of the child  
2 device includes accessing a second service of a second child device above the virtual device  
3 in the dynamic driver stack.

1           11.     An article comprising:  
2 a storage medium, said storage medium having stored thereon instructions, that, when  
3 executed by a computing device, result in:  
4 creating a virtual device;  
5 binding the virtual device to the parent device;  
6 inserting the virtual device in a driver stack below the child device; and  
7 accessing the service of the child device.

1           12.     An article according to claim 11, wherein the driver stack is a dynamic driver  
2 stack.

1           13.     An article according to claim 12, wherein accessing the service of the child  
2 device includes accessing the service of the child device by the parent device.

1           14.     An article according to claim 12, wherein accessing the service of the child  
2 device includes incrementing a reference count of a number of users of the service of the  
3 child device.

1           15.     An article according to claim 12, wherein binding the virtual device includes  
2 arranging the parent device to receive a query to remove the dynamic driver stack sent to the  
3 virtual device.

1           16.     An article according to claim 12, the storage medium having stored thereon  
2 further instructions that, when executed by the computing device, result in:

1 receiving at the virtual device a query to remove the dynamic driver stack;  
2 releasing the service of the child device; and  
3 passing the query to remove the dynamic driver stack to a next device in the dynamic  
4 driver stack.

1 17. An article according to claim 16, wherein releasing the service of the child  
2 device includes releasing the service of the child device by the parent device.

1 18. An article according to claim 16, wherein releasing the service of the child  
2 device includes invoking a code within the virtual device that accesses the parent device.

1 19. An article according to claim 16, wherein releasing the service of the child  
2 device includes decrementing a reference count of a number of users of the service of the  
3 child device.

1 20. An article according to claim 12, wherein accessing the service of the child  
2 device includes accessing a second service of a second child device above the virtual device  
3 in the dynamic driver stack.

1 21. An apparatus supporting removal of a driver stack, the apparatus comprising:  
2 a computer including a hardware component requiring the driver stack;  
3 an operating system running on the computer;  
4 the driver stack loaded onto the operating system and supporting the hardware  
5 component, the driver stack including at least a parent driver and a child driver, the child  
6 driver providing a service accessed by the parent driver; and  
7 a virtual driver installed below the child driver in the driver stack.

1 22. An apparatus according to claim 21, wherein the operating system is designed  
2 to support dynamic removal of the driver stack.

1 23. An apparatus according to claim 22, wherein the virtual driver is adapted to  
2 inform the parent driver when the driver stack is to be removed.

1 24. An apparatus according to claim 22, wherein the parent driver is adapted to  
2 insert the virtual driver into the driver stack before accessing the service provided by the  
3 child driver.

1 25. An apparatus according to claim 22, wherein the child driver includes a  
2 reference count of a number of users of the service.

a 1 26. An apparatus according to claim <sup>25</sup>26, wherein the parent driver is adapted to  
2 increment the reference count of the child driver before accessing the service provided by the  
3 child driver.

1 27. An apparatus according to claim 26, wherein the parent driver is adapted to  
2 decrement the reference count of the child driver after being informed by the virtual driver  
3 that the driver stack is to be removed and stopping use of the service provided by the child  
4 driver.